

SEQUENCE LISTING

<110> KANSAS STATE UNIVERSITY RESEARCH FOUNDATION

NAGARAJA, T.

STEWART, GEORGE

NARAYANAN, SANJEEV

CHENGAPPA, M.

<120> RECOMBINANT FUSOBACTERIUM NECROPHORUM LEUKOTOXIN VACCINE AND PREPARATION THEREOF

<130> PCT-30296

<160> 15

<170> PatentIn version 3.0

<210> 1

<211> 3241

<212> PRT

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<400> 1

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Gln Gly Glu Asn Ala Phe Asn Ser Phe Asn Arg Phe Ala Leu Thr Glu
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Ser	Ala	Thr	Ala	Thr	Ile	Glu	Lys	Asn	Glu	Val	Lys	Phe	Asn	Asn
3170						3175					3180			
Ala	Ile	Arg	Glu	Phe	Lys	Asn	Asn	Leu	Ala	Arg	Leu	Glu	Gly	Lys
3185						3190					3195			
Ala	Asn	Lys	Lys	Thr	Ser	Val	Gly	Ser	Asn	Gln	Val	Asp	Trp	Tyr
3200						3205					3210			
Thr	Asp	Lys	Tyr	Thr	Trp	His	Ser	Ser	Glu	Lys	Ala	Tyr	Lys	Lys
3215						3220					3225			

PCT302~1

Leu Thr Tyr Gln Ser Lys Arg Gly Glu Lys Gly Lys Lys  
 3230 3235 3240

<210> 2

<211> 369

<212> PRT

<213> Fusobacterium necrophorum

<400> 2

Met Ser Gly Ile Lys Asn Asn Val Gln Arg Thr Arg Lys Arg Ile Ser  
 1 5 10 15  
 Asp Ser Lys Lys Val Leu Met Ile Leu Gly Leu Leu Ile Asn Thr Met  
 20 25 30  
 Thr Val Arg Ala Asn Asp Thr Ile Thr Ala Thr Glu Asn Phe Gly Thr  
 35 40 45  
 Lys Ile Glu Lys Lys Asp Asn Val Tyr Asp Ile Thr Thr Asn Lys Ile  
 50 55 60  
 Gln Gly Glu Asn Ala Phe Asn Ser Phe Asn Arg Phe Ala Leu Thr Glu  
 65 70 75 80  
 Asn Asn Ile Ala Asn Leu Tyr Phe Gly Glu Lys Asn Ser Thr Gly Val  
 85 90 95  
 Asn Asn Leu Phe Asn Phe Val Asn Gly Lys Ile Glu Val Asp Gly Ile  
 100 105 110  
 Ile Asn Gly Ile Arg Glu Asn Lys Ile Gly Gly Asn Leu Tyr Phe Leu  
 115 120 125  
 Ser Ser Glu Gly Met Ala Val Gly Lys Asn Gly Val Ile Asn Ala Gly  
 130 135 140  
 Ser Phe His Ser Ile Ile Pro Lys Gln Asp Asp Phe Lys Lys Ala Leu  
 145 150 155 160  
 Glu Glu Ala Lys His Gly Lys Val Phe Asn Gly Ile Ile Pro Val Asp  
 165 170 175  
 Gly Lys Val Lys Ile Pro Leu Asn Pro Asn Gly Ser Ile Thr Val Glu  
 180 185 190  
 Gly Lys Ile Asn Ala Val Glu Gly Ile Gly Leu Tyr Ala Ala Asp Ile  
 195 200 205  
 Arg Leu Lys Asp Thr Ala Ile Leu Lys Thr Gly Ile Thr Asp Phe Lys  
 210 215 220  
 Asn Leu Val Asn Ile Ser Asp Arg Ile Asn Ser Gly Leu Thr Gly Asp  
 225 230 235 240  
 Leu Lys Ala Thr Lys Thr Lys Ser Gly Asp Ile Ile Leu Ser Ala His  
 245 250 255  
 Ile Asp Ser Pro Gln Lys Ala Met Gly Lys Asn Ser Thr Val Gly Lys  
 260 265 270  
 Arg Ile Glu Glu Tyr Val Lys Gly Asn Thr Lys Ala Asn Ile Glu Ser

PCT302~1

275	280	285
Asp Ala Val Leu Glu Ala Asp Gly Asn Ile Lys Ile Ser Ala Lys Ala	290	300
Thr Asn Gly Arg Phe Ile Lys Lys Glu Gly Glu Lys Glu Thr Tyr Asn	310	320
Thr Pro Leu Ser Leu Ser Asp Val Glu Ala Ser Val Arg Val Asn Lys	325	335
Gly Lys Val Ile Gly Lys Asn Val Asp Ile Thr Ala Glu Ala Lys Asn	340	350
Phe Tyr Asp Ala Thr Leu Val Thr Lys Leu Ala Lys His Ser Phe Ser	355	365

Phe

<210> 3

<211> 927

<212> PRT

<213> Fusobacterium necrophorum

<400> 3

Gly Arg Phe Ile Lys Lys Glu Gly Glu Lys Glu Thr Tyr Asn Thr Pro	5	10	15
Leu Ser Leu Ser Asp Val Glu Ala Ser Val Arg Val Asn Lys Gly Lys	20	25	30
Val Ile Gly Lys Asn Val Asp Ile Thr Ala Glu Ala Lys Asn Phe Tyr	35	40	45
Asp Ala Thr Leu Val Thr Lys Leu Ala Lys His Ser Phe Ser Phe Val	50	55	60
Thr Gly Ser Ile Ser Pro Ile Asn Leu Asn Gly Phe Leu Gly Leu Leu	65	70	75
Thr Ser Lys Ser Ser Val Val Ile Gly Lys Asp Ala Lys Val Glu Ala	85	90	95
Thr Glu Gly Lys Ala Asn Ile His Ser Tyr Ser Gly Val Arg Ala Thr	100	105	110
Met Gly Ala Ala Thr Ser Pro Leu Lys Ile Thr Asn Leu Tyr Leu Glu	115	120	125
Lys Ala Asn Gly Lys Leu Leu Ser Ile Gly Ala Gly Tyr Ile Ser Ala	130	135	140
Lys Ser Asn Ser Asn Val Thr Ile Glu Gly Glu Val Lys Ser Lys Gly	145	150	155
Arg Ala Asp Ile Thr Ser Lys Ser Glu Asn Thr Ile Asp Ala Ser Val	165	170	175
Ser Val Gly Thr Met Arg Asp Ser Asn Lys Val Ala Leu Ser Val Leu	180	185	190

PCT302~1

Val	Thr	Glu	Gly	Glu	Asn	Lys	Ser	Ser	Val	Lys	Ile	Ala	Lys	Gly	Ala
		195					200					205			
Lys	Val	Glu	Ser	Glu	Thr	Asp	Asp	Val	Asn	Val	Arg	Ser	Glu	Ala	Ile
	210					215					220				
Asn	Ser	Ile	Arg	Ala	Ala	Val	Lys	Gly	Gly	Leu	Gly	Asp	Ser	Gly	Asn
225					230					235					240
Gly	Val	Val	Ala	Ala	Asn	Ile	Ser	Asn	Tyr	Asn	Ala	Ser	Ser	Arg	Ile
				245					250					255	
Asp	Val	Asp	Gly	Tyr	Leu	His	Ala	Lys	Lys	Arg	Leu	Asn	Val	Glu	Ala
			260					265					270		
His	Asn	Ile	Thr	Lys	Asn	Ser	Val	Leu	Gln	Thr	Gly	Ser	Asp	Leu	Gly
	275						280					285			
Thr	Ser	Lys	Phe	Met	Asn	Asp	His	Val	Tyr	Glu	Ser	Gly	His	Leu	Lys
	290					295					300				
Ser	Ile	Leu	Asp	Ala	Ile	Lys	Gln	Arg	Phe	Gly	Gly	Asp	Ser	Val	Asn
305					310					315					320
Glu	Glu	Ile	Lys	Asn	Lys	Leu	Thr	Asn	Leu	Phe	Ser	Val	Gly	Val	Ser
				325					330					335	
Ala	Thr	Ile	Ala	Asn	His	Asn	Asn	Ser	Ala	Ser	Val	Ala	Ile	Gly	Glu
			340					345					350		
Ser	Gly	Arg	Leu	Ser	Ser	Gly	Val	Glu	Gly	Ser	Asn	Val	Arg	Ala	Leu
		355					360					365			
Asn	Glu	Ala	Gln	Asn	Leu	Arg	Ala	Thr	Thr	Ser	Ser	Gly	Ser	Val	Ala
	370					375					380				
Val	Arg	Lys	Glu	Glu	Lys	Lys	Lys	Leu	Ile	Gly	Asn	Ala	Ala	Val	Phe
385					390					395					400
Tyr	Gly	Asn	Tyr	Lys	Asn	Asn	Ala	Ser	Val	Thr	Ile	Ala	Asp	His	Ala
				405					410					415	
Glu	Leu	Val	Ser	Glu	Gly	Lys	Ile	Asp	Ile	Asn	Ser	Glu	Asn	Lys	Ile
			420					425					430		
Glu	Tyr	Lys	Asn	Pro	Ser	Lys	Met	Ala	Lys	Ser	Val	Ile	Asp	Lys	Leu
		435					440					445			
Glu	Leu	Leu	Lys	Arg	Ala	Phe	Gly	Lys	Glu	Thr	Lys	Thr	Pro	Glu	Tyr
	450					455					460				
Asp	Pro	Lys	Asp	Ile	Glu	Ser	Ile	Glu	Lys	Leu	Leu	Asn	Ala	Phe	Ser
465					470					475					480
Glu	Lys	Leu	Asp	Gly	Lys	Pro	Glu	Leu	Leu	Leu	Asn	Gly	Glu	Arg	Met
				485					490					495	
Thr	Ile	Ile	Leu	Pro	Asp	Gly	Thr	Ser	Lys	Thr	Gly	Thr	Ala	Ile	Glu
			500					505					510		
Ile	Ala	Asn	Tyr	Val	Gln	Gly	Glu	Met	Lys	Lys	Leu	Glu	Glu	Lys	Leu
		515					520					525			
Pro	Lys	Gly	Phe	Lys	Ala	Phe	Ser	Glu	Gly	Leu	Ser	Gly	Leu	Ile	Lys
	530					535					540				
Glu	Thr	Leu	Asn	Phe	Thr	Gly	Val	Gly	Asn	Tyr	Ala	Asn	Phe	His	Thr
545					550					555					560

PCT302~1

Phe Thr Ser Ser Gly Ala Asn Gly Glu Arg Asp Val Ser Ser Val Gly  
 565 570 575  
 Gly Ala Val Ser Trp Val Glu Gln Glu Asn Tyr Ser Lys Val Ser Val  
 580 585 590  
 Gly Lys Gly Ala Lys Leu Ala Ala Lys Lys Asp Leu Asn Ile Lys Ala  
 595 600 605  
 Ile Asn Lys Ala Glu Thr Val Asn Leu Val Gly Asn Ile Gly Leu Ala  
 610 615 620  
 Arg Ser Ser Thr Ser Gly Ser Ala Val Gly Gly Arg Leu Asn Val Gln  
 625 630 635 640  
 Arg Ser Lys Asn Ser Ala Ile Val Glu Ala Lys Glu Lys Ala Glu Leu  
 645 650 655  
 Ser Gly Glu Asn Ile Asn Ala Asp Ala Leu Asn Arg Leu Phe His Val  
 660 665 670  
 Ala Gly Ser Phe Asn Gly Gly Ser Gly Gly Asn Ala Ile Asn Gly Met  
 675 680 685  
 Gly Ser Tyr Ser Gly Gly Ile Ser Lys Ala Arg Val Ser Ile Asp Asp  
 690 695 700  
 Glu Ala Tyr Leu Lys Ala Asn Lys Lys Ile Ala Leu Asn Ser Lys Asn  
 705 710 715 720  
 Asp Thr Ser Val Trp Asn Ala Ala Gly Ser Ala Gly Ile Gly Thr Lys  
 725 730 735  
 Asn Ala Ala Val Gly Val Ala Val Ala Val Asn Asp Tyr Asp Ile Ser  
 740 745 750  
 Asn Lys Ala Ser Ile Glu Asp Asn Asp Glu Gly Gln Ser Lys Tyr Asp  
 755 760 765  
 Lys Asn Lys Asp Asp Glu Val Thr Val Thr Ala Glu Ser Leu Glu Val  
 770 775 780  
 Asp Ala Lys Thr Thr Gly Thr Ile Asn Ser Ile Ser Val Ala Gly Gly  
 785 790 795 800  
 Ile Asn Lys Val Gly Ser Lys Pro Ser Glu Glu Lys Pro Lys Ser Glu  
 805 810 815  
 Glu Arg Pro Glu Gly Phe Phe Gly Lys Ile Gly Asn Lys Val Asp Ser  
 820 825 830  
 Val Lys Asn Lys Ile Thr Asp Ser Met Asp Ser Leu Thr Glu Lys Ile  
 835 840 845  
 Thr Asn Tyr Ile Ser Glu Gly Val Lys Lys Ala Gly Asn Leu Pro Ser  
 850 855 860  
 Asn Val Ser His Thr Pro Asp Lys Gly Pro Ser Phe Ser Leu Gly Ala  
 865 870 875 880  
 Ser Gly Ser Val Ser Phe Asn Asn Ile Lys Lys Glu Thr Ser Ala Val  
 885 890 895  
 Val Asp Gly Val Lys Ile Asn Leu Lys Gly Ala Asn Lys Lys Val Glu  
 900 905 910  
 Val Thr Ser Ser Asp Ser Thr Phe Val Gly Ala Trp Gly Gly Ser

915                                      920                                      925  
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 <211> 580  
 <212> PRT  
 <213> *Fusobacterium necrophorum*  
  
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 Asp Gly Val Lys Asn Lys Gly Ala Asn Lys Lys Val Val Thr Ser Ser  
                                     20                                      25                                      30  
 Asp Ser Thr Val Gly Ala Trp Gly Gly Ser Ala Ala Trp Asn His Gly  
                                     35                                      40                                      45  
 Ser Gly Asn Ser Asn Ser Ala Gly Ala Gly Ala Ala Val Asn Asn  
                                     50                                      55                                      60  
 Ser Lys Thr Ser Ala Val Lys Asn Ser Asp Arg Asn Ala Asn Lys Lys  
 65                                      70                                      75                                      80  
 Val Asn Ala Ser Gly Gly Thr Val Ala Ala Gly Ala Gly Ala Val Lys  
                                     85                                      90                                      95  
 Ser Gly Gly Gly Lys Ser Tyr Gly Thr Ser Ala Ser Asn Val Asn Asn  
                                     100                                      105                                      110  
 Val Ser Ala Lys Ser Asn Asn Thr Val Ala Gly Ser Ser Lys Met Asp  
                                     115                                      120                                      125  
 Val Asp Val Thr Ala Tyr Ala Asp Thr Val Thr Gly Ala Asn Ala Gly  
                                     130                                      135                                      140  
 Lys Ser Asn Gly Thr Val Gly Ala Thr Val Thr Val Ala Lys Asn Asn  
 145                                      150                                      155                                      160  
 Lys Val Asn Ala Ser Ser Gly Gly Arg Tyr Thr Asn Val Asn Arg Ala  
                                     165                                      170                                      175  
 Asp Ala Lys Ala Ala Thr Thr Val Thr Ala Ala Val Thr Thr Gly Gly  
                                     180                                      185                                      190  
 Thr Ser Ser Gly Ala Gly Gly Asn Tyr Gly Ala Val Ser Val Asn Lys  
                                     195                                      200                                      205  
 Asp Asn Asp Val Ala Ser Val Asp Lys Ser Ser Gly Ala Asn Asn Val  
                                     210                                      215                                      220  
 Ala Lys Asp Val Lys Gly Ser Ser Asp Ala Lys Tyr Ala Asn Gly Lys  
 225                                      230                                      235                                      240  
 Asp Lys Lys Tyr Asp Arg Gly Asn Thr Thr Gly Asn Gly Tyr Tyr Thr  
                                     245                                      250                                      255  
 Lys Lys Ala Lys Lys Lys Gly Ala Val Val Asn Ala Ala Ser Val Ala  
                                     260                                      265                                      270  
 Gly Thr Asp Lys Ser Ala Gly Gly Val Ala Ala Val Asn Thr Val Lys  
                                     275                                      280                                      285

PCT302~1

Asn Lys Lys Ala Ser Gly Ser Asn Lys Ala Gly Asp Lys His Ala Lys  
 290 295 300  
 His Val Asn Val Ala Lys Ser Ser Thr Val Val Val Asn Ala Ala Ser  
 305 310 315 320  
 Gly Ala Ser Lys Asp Ala Ser Gly Met Gly Ser Gly Ala Trp Asp Ser  
 325 330 335  
 Asn Asp Thr Ala Lys Val Asp Lys Gly Arg Ser Ala Asp Ser Asn Val  
 340 345 350  
 Asn Ala Asn Asn Ser Gly Val Asn Val Ala Gly Thr Ala Gly Ser Ser  
 355 360 365  
 Thr Ala Val Gly Ala Ala Ala Asn Asn Thr His Asn Lys Thr Ser Ala  
 370 375 380  
 Thr Gly Thr Lys Val Asn Ser Gly Lys Asn Thr Lys Val Asn Val Ala  
 385 390 395 400  
 Asn Asp Ser His Thr Asn Val Ser Ala Gly Gly Ala Ala Ser Lys Ala  
 405 410 415  
 Gly Gly Gly Met Val Ser Val Asn Arg Gly Ser Asp Thr Ala Val Ser  
 420 425 430  
 Asp Ser Gly Val Ser Ser Asn Val Asp Ala Lys Asp Lys Thr Asn Thr  
 435 440 445  
 Ala Gly Asn Ala Asn Gly Gly Lys Ala Ala Gly Val Gly Ala Thr Val  
 450 455 460  
 Ala His Thr Asn Gly Lys Ser Val Ala Val Lys Asn Ser Lys Thr Thr  
 465 470 475 480  
 Ala Asn Asp Asp Arg Lys Asn Asn Val Thr Ala Lys Asp Tyr Thr Met  
 485 490 495  
 Thr Asn Thr Ala Val Gly Val Gly Gly Ala Lys Gly Ala Ser Val Gly  
 500 505 510  
 Ala Ser Ala Ser Thr Thr Asn Lys Thr Val Ser Ser His Val Asp Thr  
 515 520 525  
 Asp Asp Lys Asp Asn Asn Gly Asn Lys Lys Ala Asn Val Asn Val Ala  
 530 535 540  
 Asn Thr Ser Val Val Thr Asn Ala Thr Val Ser Gly Ala Ser Gly Ala  
 545 550 555 560  
 Ala Val Gly Ala Gly Val Ala Val Asn Lys Thr Asn Thr Ser Ala His  
 565 570 575  
 Lys Asn Ser Thr  
 580

<210> 5

<211> 628

<212> PRT

<213> Fusobacterium necrophorum

<400> 5



## PCT302~1

Ala Val Gly Ala Gly Val Ala Val Asn Lys Ile Thr Gln Asn Thr Ser  
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 Ala His Ile Lys Asn Ser Thr Gln Asn Val Arg Asn Ala Leu Val Lys  
 20 25 30  
 Ser Lys Ser His Ser Ser Ile Lys Thr Ile Gly Ile Gly Ala Gly Val  
 35 40 45  
 Gly Ala Gly Gly Ala Gly Val Thr Gly Ser Val Ala Val Asn Lys Ile  
 50 55 60  
 Val Asn Asn Thr Ile Ala Glu Leu Asn His Ala Lys Ile Thr Ala Lys  
 65 70 75 80  
 Gly Asn Val Gly Val Ile Thr Glu Ser Asp Ala Val Ile Ala Asn Tyr  
 85 90 95  
 Ala Gly Thr Val Ser Gly Val Ala Arg Ala Ala Ile Gly Ala Ser Thr  
 100 105 110  
 Ser Val Asn Glu Ile Thr Gly Ser Thr Lys Ala Tyr Val Lys Asp Ser  
 115 120 125  
 Thr Val Ile Ala Lys Glu Glu Thr Asp Asp Tyr Ile Thr Thr Gln Gly  
 130 135 140  
 Gln Val Asp Lys Val Val Asp Lys Val Phe Lys Asn Leu Asn Ile Asn  
 145 150 155 160  
 Glu Asp Leu Ser Gln Lys Arg Lys Ile Ser Asn Lys Lys Gly Phe Val  
 165 170 175  
 Thr Asn Ser Ser Ala Thr His Thr Leu Lys Ser Leu Leu Ala Asn Ala  
 180 185 190  
 Ala Gly Ser Gly Gln Ala Gly Val Ala Gly Thr Val Asn Ile Asn Lys  
 195 200 205  
 Val Tyr Gly Glu Thr Glu Ala Leu Val Glu Asn Ser Ile Leu Asn Ala  
 210 215 220  
 Lys His Tyr Ser Val Lys Ser Gly Asp Tyr Thr Asn Ser Ile Gly Val  
 225 230 235 240  
 Val Gly Ser Val Gly Val Gly Gly Asn Val Gly Val Gly Ala Ser Ser  
 245 250 255  
 Asp Thr Asn Ile Ile Lys Arg Asn Thr Lys Thr Arg Val Gly Lys Thr  
 260 265 270  
 Thr Met Ser Asp Glu Gly Phe Gly Glu Glu Ala Glu Ile Thr Ala Asp  
 275 280 285  
 Ser Lys Gln Gly Ile Ser Ser Phe Gly Val Gly Val Ala Ala Ala Gly  
 290 295 300  
 Val Gly Ala Gly Val Ala Gly Thr Val Ser Val Asn Gln Phe Ala Gly  
 305 310 315 320  
 Lys Thr Glu Val Asp Val Glu Glu Ala Lys Ile Leu Val Lys Lys Ala  
 325 330 335  
 Glu Ile Thr Ala Lys Arg Tyr Ser Ser Val Ala Ile Gly Asn Ala Ala  
 340 345 350  
 Val Gly Val Ala Ala Lys Gly Ala Gly Ile Gly Ala Ala Val Ala Val

## PCT302~1

355 360 365  
 Thr Lys Asp Glu Ser Asn Thr Arg Ala Arg Val Lys Asn Ser Lys Ile  
 370 375 380  
 Met Thr Arg Asn Lys Leu Asp Val Ile Ala Glu Asn Glu Ile Lys Ser  
 385 390 395 400  
 Gly Thr Gly Ile Gly Ser Ala Gly Ala Gly Ile Leu Ala Ala Gly Val  
 405 410 415  
 Ser Gly Val Val Ser Val Asn Asn Ile Ala Asn Lys Val Glu Thr Asp  
 420 425 430  
 Ile Asp His Ser Thr Leu His Ser Ser Thr Asp Val Asn Val Lys Ala  
 435 440 445  
 Leu Asn Lys Ile Ser Asn Ser Leu Thr Ala Gly Gly Gly Ala Ala Gly  
 450 455 460  
 Leu Ala Ala Val Thr Gly Val Val Ser Val Asn Thr Ile Asn Ser Ser  
 465 470 475 480  
 Val Ile Ala Arg Val His Asn Asn Ser Asp Leu Thr Ser Val Arg Glu  
 485 490 495  
 Lys Val Asn Val Thr Ala Lys Glu Glu Lys Asn Ile Lys Gln Thr Ala  
 500 505 510  
 Ala Asn Ala Gly Ile Gly Gly Ala Ala Ile Gly Ala Asn Val Leu Val  
 515 520 525  
 Asn Asn Phe Gly Thr Ala Val Glu Asp Arg Lys Asn Ser Glu Gly Lys  
 530 535 540  
 Gly Thr Glu Val Leu Lys Thr Leu Asp Glu Val Asn Lys Glu Gln Asp  
 545 550 555 560  
 Lys Lys Val Asn Asp Ala Thr Lys Lys Ile Leu Gln Ser Ala Gly Ile  
 565 570 575  
 Ser Thr Glu Asp Thr Ser Val Lys Ala Asp Arg Gly Asp Thr Gln Gly  
 580 585 590  
 Glu Gly Ile Lys Ala Ile Val Lys Thr Ser Asp Ile Ile Gly Lys Asn  
 595 600 605  
 Val Asp Ile Thr Thr Glu Asp Lys Asn Asn Ile Thr Ser Thr Gly Gly  
 610 615 620  
 Leu Gly Thr Ala  
 625  
 <210> 6  
 <211> 773  
 <212> PRT  
 <213> *Fusobacterium necrophorum*  
  
 <400> 6  
 Gly Ile Lys Ala Ile Val Lys Thr Ser Asp Ile Ile Gly Lys Asn Val  
 1 5 10 15

Asp Ile Thr Thr Glu Asp Lys Asn Asn Ile Thr Ser Thr Gly Gly Leu  
 20 25 30  
 Gly Thr Ala Gly Leu Ala Ser Ala Ser Gly Thr Val Ala Val Thr Asn  
 35 40 45  
 Ile Lys Arg Asn Ser Gly Val Thr Val Glu Asn Ser Phe Val Lys Ala  
 50 55 60  
 Ala Glu Lys Val Asn Val Arg Ser Asp Ile Thr Gly Asn Val Ala Leu  
 65 70 75 80  
 Thr Ala Tyr Gln Gly Pro Val Gly Ala Leu Gly Ile Gly Ala Ala Tyr  
 85 90 95  
 Ala Glu Leu Asn Ser Asn Gly Arg Ser Asn Ile Ser Ile Lys Asn Ser  
 100 105 110  
 Lys Leu Leu Gly Lys Asn Ile Asp Val Ile Val Lys Asp Lys Ser Glu  
 115 120 125  
 Leu Arg Ala Glu Ala Lys Gly Leu Thr Val Gly Ala Val Ala Ala Gly  
 130 135 140  
 Ala Ile Ile Ser Lys Ala Lys Asn Glu Met Asn Ser Glu Val Glu Ile  
 145 150 155 160  
 Glu Lys Ser Ile Phe Asn Glu Glu Asn Arg Val Thr Ser Pro Ser Lys  
 165 170 175  
 Gly Ile Gly Arg Glu Ile Asn Val Lys Val Glu Lys Glu Asn Arg Val  
 180 185 190  
 Thr Ala Glu Ser Gln Gly Ala Ser Val Gly Ala Val Ala Gly Ala Gly  
 195 200 205  
 Ile Ile Ser Glu Ala Lys Asp Ala Gly Ser Ser Tyr Leu Lys Val Ser  
 210 215 220  
 Thr Lys Ser Gly Arg Ser Ile Phe His Ala Asp Asn Val Asn Met Glu  
 225 230 235 240  
 Ala Thr His Lys Met Lys Val Thr Ala Val Ser Lys Ala Val Thr Gly  
 245 250 255  
 Ser Val Leu Gly Gly Val Gly Val Thr Lys Ala Glu Ala Thr Ala Ala  
 260 265 270  
 Gly Lys Thr Met Val Glu Val Glu Glu Gly Asn Leu Phe Arg Thr Asn  
 275 280 285  
 Arg Leu Asn Ala Ile Ser Lys Val Glu Gly Leu Asp Glu Asp Lys Val  
 290 295 300  
 Thr Ala Lys Ser Ser Val Val Ser Gly Asn Gly Gly Gly Ile Ala Gly  
 305 310 315 320  
 Ala Gly Val Asn Thr Ser Thr Ala Gln Ser Asn Thr Glu Ser Val Val  
 325 330 335  
 Arg Leu Arg Lys Gln Asp Tyr Glu Asn Asn Asp Tyr Thr Lys Lys Tyr  
 340 345 350  
 Ile Ser Glu Val Asn Ala Leu Ala Leu Asn Asp Thr Lys Asn Glu Ala  
 355 360 365  
 Asn Ile Glu Ser Leu Ala Val Ala Gly Val His Ala Gln Gly Thr Asn  
 370 375 380

## PCT302~1

Lys Ala Phe Thr Arg Ser Asn Lys Leu Thr Ser Thr Thr Val Asn Gly  
 385 390 395 400  
 Gly Asn Val Ser Gln Leu Arg Ala Lys Ala Leu Ala Lys Asn Glu Asn  
 405 410 415  
 Tyr Gly Asn Val Lys Gly Thr Gly Gly Ala Leu Val Gly Ala Glu Thr  
 420 425 430  
 Ala Ala Val Glu Asn Tyr Thr Lys Ser Thr Thr Gly Ala Leu Val Ala  
 435 440 445  
 Gly Asn Trp Glu Ile Gly Asp Lys Leu Glu Thr Ile Ala Arg Asp Asn  
 450 455 460  
 Thr Ile Val Arg Val Asn Gly Asp Gly Thr Lys Gly Gly Leu Val Gly  
 465 470 475 480  
 Lys Asn Gly Ile Ser Val Lys Asn Thr Ile Ser Gly Glu Thr Lys Ser  
 485 490 495  
 Ser Ile Glu Asp Lys Ala Arg Ile Val Gly Thr Gly Ser Val Asn Val  
 500 505 510  
 Asp Ala Leu Asn Glu Leu Asp Val Asp Leu Gln Gly Lys Ser Gly Gly  
 515 520 525  
 Tyr Gly Gly Ile Gly Ile Gly Asn Val Asp Val Asn Asn Val Ile Lys  
 530 535 540  
 Lys Asn Val Glu Ala Lys Ile Gly Arg His Ala Ile Val Glu Thr Thr  
 545 550 555 560  
 Gly Lys Gln Glu Tyr Gln Ala Phe Thr Arg Ala Lys Val Asn Ile Leu  
 565 570 575  
 Gly Lys Gly Asp Ala Ala Ala Ala Ala Ile Ser Asn Val His Ile  
 580 585 590  
 Ser Asn Glu Met Asp Ile Lys Asn Leu Ala Lys Gln Tyr Ala Ser Ser  
 595 600 605  
 Gln Leu Ile Thr Lys Asn Ser Lys Asn Asn Ile Thr Leu Ala Ser Ser  
 610 615 620  
 Ser Glu Ser Asn Val Asn Val His Gly Val Ala Glu Ala Arg Gly Ala  
 625 630 635 640  
 Gly Ala Lys Ala Thr Val Ser Val Lys Asn Gln Ile Asn Arg Thr Asn  
 645 650 655  
 Asn Val Asp Leu Ala Gly Lys Ile Lys Thr Glu Gly Asn Ile Asn Val  
 660 665 670  
 Tyr Ala Gly Tyr Asp Lys Asn Tyr Asn Ile Ser Lys Thr Asn Ser Lys  
 675 680 685  
 Ala Ile Ala Asp Ala Lys Ser His Ala Ala Ala Ala Ser Ala Thr Ala  
 690 695 700  
 Thr Ile Glu Lys Asn Glu Val Lys Phe Asn Asn Ala Ile Arg Glu Phe  
 705 710 715 720  
 Lys Asn Asn Leu Ala Arg Leu Glu Gly Lys Ala Asn Lys Lys Thr Ser  
 725 730 735  
 Val Gly Ser Asn Gln Val Asp Trp Tyr Thr Asp Lys Tyr Thr Trp His

## PCT302~1

740 745 750  
 Ser Ser Glu Lys Ala Tyr Lys Lys Leu Thr Tyr Gln Ser Lys Arg Gly  
 755 760 765  
 Glu Lys Gly Lys Lys  
 770  
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 <211> 338  
 <212> PRT  
 <213> Fusobacterium necrophorum  
  
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 Gln Ile Tyr Glu Pro Lys Arg Gln Gln Phe Phe Val Phe Ala Asp Asn  
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 Leu Gly Gln Lys Asn Thr Gly Glu Leu Arg Trp Gly Leu Asn Tyr Ile  
 35 40 45  
 Asn Asn Ser Val Thr Gly Asn Arg Asp Gln Leu Ser Leu Thr Ser Leu  
 50 55 60  
 Val Thr Glu Gly Thr Ala Ser Leu Ser Ser Phe Tyr Thr Phe Pro Val  
 65 70 75 80  
 Ser Lys Lys Gly Thr Lys Ile Ser Leu Gln His Ser Val Gly Lys Leu  
 85 90 95  
 Lys His Ile Gln Gly Ala Leu Lys His Lys Ile Thr Gly Asn Ser Tyr  
 100 105 110  
 Ser Tyr Gly Val Gly Ile Val His Pro Ile Leu Val His Glu Lys Asn  
 115 120 125  
 Lys Val Glu Leu Ser Leu Asp Trp Val Lys Gln Arg Thr Val Thr Asp  
 130 135 140  
 Leu Leu Lys Leu Lys Trp Val Asn Asn Arg Leu Ser Lys Tyr Thr Ala  
 145 150 155 160  
 Gly Ile Gly Ile Ser His Tyr Glu Glu Asp Ser Val Phe Tyr Thr Lys  
 165 170 175  
 Gln Asn Ile Thr Lys Gly Lys Phe Ile Pro Ile Ser Gly Asp Ala Arg  
 180 185 190  
 Asn Tyr Thr Lys Tyr Asp Met Phe Leu Ile Tyr Gln Lys Asn Leu Lys  
 195 200 205  
 Tyr Asn Thr Leu Val Thr Leu Lys Met Ala Gly Gln Tyr Ser Leu Ser  
 210 215 220  
 Lys Lys Leu Pro Ser Val Glu Gln Ile Tyr Ala Gly Gly Ala Tyr Asn  
 225 230 235 240  
 Val Arg Gly Tyr Pro Glu Asn Phe Met Gly Ala Glu His Gly Val Phe  
 245 250 255

PCT302~1

Phe Asn Ala Glu Leu Ser Lys Leu Val Glu Asn Lys Gly Glu Phe Phe  
                   260                                  265                                  270

Val Phe Leu Asp Gly Ala Ser Leu His Gly Glu Ser Ala Trp Gln Glu  
                   275                                  280                                  285

Asn Arg Ile Phe Ser Ser Gly Phe Gly Tyr Lys Ile Arg Phe Leu Glu  
                   290                                  295                                  300

Lys Asn Asn Ile Ala Val Ser Met Ala Phe Pro Trp Lys Lys Lys Ile  
                   305                                  310                                  315                                  320

Asn Ser Ile Ser Val Asp Ser Asn Arg Ile Tyr Ile Thr Ile Asn His  
                   325                                  330                                  335

Glu Phe

<210> 8

<211> 9726

<212> DNA

<213> *Fusobacterium necrophorum*

<400> 8

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accgcgactg agaatttttg aacaaaaata gaaaaaaagg ataatgttta tgacattact	180
acaaacaaga ttcaagggga gaacgctttt aacagtttta atagatttgc tttaacagaa	240
aataatatag caaatctata ttttggggaa aagaatagta cgggggtaaa taatcttttt	300
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<210> 11

<211> 2141

<212> DNA

<213> *Fusobacterium necrophorum*

<400> 11

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PCT302~1

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<210> 12

<211> 1887

<212> DNA

<213> *Fusobacterium necrophorum*

<400> 12

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&lt;210&gt; 13

&lt;211&gt; 2322

&lt;212&gt; DNA

<213> *Fusobacterium necrophorum*

PCT302~1

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&lt;211&gt; 1017

&lt;212&gt; DNA

<213> *Fusobacterium necrophorum*

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&lt;210&gt; 15

&lt;211&gt; 11130

&lt;212&gt; DNA

<213> *Fusobacterium necrophorum*

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